

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 2 of 17

Amendments to the Drawings:

The attached drawing sheets include changes to **Figures 1 and 10**. The attached drawing sheets replace original drawing sheet 1 (including **Figure 1**), and original drawing sheet 6 (including **Figures 10-12**).

Attachments: Replacement Sheet 1, including **Figure 1**, and
Replacement Sheet 6, including **Figures 10-12**.

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 7 of 17

REMARKS

Applicants hereby request further consideration of the application in view of the amendments above and the comments that follow. Applicants wish to thank the Examiner for the English language translation of Japanese Patent Application JP 401027225A to Kuramata forwarded to Applicants' attorney, David Beatty, on May 17, 2006.

The Objections

Applicants appreciate the Examiner's careful consideration of the present application and identification of the informalities in the drawings. The specification and the drawings have been amended to address the Examiner's objections to the drawings and specification.

Status of the Claims

Claims 1-12 are pending the present application. Claims 1 and 2 stand rejected under Section 103(a) as being unpatentable over U.S. Patent No. 5,695,567 to Kordina et al. (Kordina). Claims 3, 4 and 8-11 stand rejected under Section 103(a) as being unpatentable over Kordina in view of Japanese Patent Application JP 401027225A to Kuramata (Kuramata) and U.S. Patent No. 6,331,212 to Mezey (Mезey). Claims 5-7 and 12 stand rejected under Section 103(a) as being unpatentable over Kordina in view of U.S. Patent No. 6,406,983 to Hölzlein (Hölzlein).

The Rejections Under Section 103

Claims 1 and 2:

Claim 1 stands rejected under Section 103 over Kordina. Claim 1 recites, *inter alia*:

c) wherein the liner is removable from the susceptor without requiring disassembly of the susceptor.

To establish a *prima facie* case of obviousness, the prior art reference or references when combined must teach or suggest *all* the recitations of the claim. MPEP § 2143. Kordina does not teach or suggest a liner that is removable from the susceptor thereof without

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 8 of 17

requiring disassembly of the susceptor. To the contrary, the plates 16, 17 of Kordina are sandwiched between the top and bottom wall pieces 13, 14 and the lateral wall pieces 11, 12 such that the susceptor wall pieces 11, 12, 13, 14 must be disassembled to remove the plates 16, 17. *See*, Kordina at paragraph [0020]. It is not apparent how the Kordina apparatus might be modified to satisfy the recitations of Claim 1. To the contrary, it is likely that any modification to Kordina that would allow the plates 16, 17 to be removed from the wall pieces 11-14 without disassembly would destroy, at least in part, the functionality of the Kordina apparatus. The plates 16, 17 are deliberately inserted between the side wall pieces 11, 12 and the top wall piece 13 and between the side wall pieces 11, 12 and the bottom wall piece 14 to prevent etching of the SiC-coating and the walls of the susceptor close to the edges of the SiC plates (*see, e.g.*, Kordina at paragraphs [0010] and [0021]).

The Action states at page 3:

Examiner responds that Kordina et al teaches use of screws 15 to secure liner plate 16, 17 with susceptor plates 11-14 as against pin 139 and holes 130A (in liner 160) and 160A 9in (liner 160); or tab 110B (in bottom susceptor 110) and recess 152B (in liner 150 {for example} used by the applicant to secure liner to susceptor. Both apparatus (Kordina et al as well as applicant) would thus need disassembly of susceptor.

The Action further states at page 6:

Kordina et al also teach that it is easy to assemble the susceptor plates 11-14 and to secure these with liner plates 16, 17 using screws 15 which is equivalent to other securing means like using pins and holes or tab with recess. Therefore it would have been obvious to use susceptor and liner configuration as taught by Kordina et al to avoid non-uniform etching on susceptor parts. In this connection courts have ruled (Case law):

"Making elements separable was held to have been obvious. *In re Dulberg* 129 USPQ 148 (CCPA 1961).

Applicants first note that the liner recited in Claim 1 does not read on the liner 160 as shown in Applicants' specification and secured to the susceptor by pins 139. Rather, it is the liner 150 that can be removed without requiring disassembly of the susceptor. More particularly, the liner members 152, 154 of the liner 150 are placed on the bottom susceptor member 110. The tab 110B merely locates and secures the liner member 152 in place on the

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 9 of 17

bottom member 110. Removal of the liner members 152, 154 is simply the reverse of installation, *i.e.*, the liner members 152, 154 can simply be lifted up and out of the susceptor through the front or rear opening 104, 106. Notably, no disassembly of the susceptor (which includes susceptor members 110, 120, 130) is necessary to remove the liner members 152, 154.

Thus, the Action's contention that "[b]oth apparatus (Kordina et al as well as applicant) would thus need disassembly of susceptor" is incorrect as to Applicants' apparatus. The Action is correct in acknowledging that Kordina requires disassembly of the susceptor thereof to remove either liner plate 16, 17, but the liner 150 of Applicants' apparatus can clearly be removed without disassembling the susceptor thereof.

Nor is it understood how the securing features and configuration of Kordina could be regarded as "equivalent" to the "tab with recess" of Applicants' exemplary apparatus 100. The Kordina liner plate securing arrangement and Applicants' exemplary mounting arrangement are decidedly not equivalent for reasons directly on point to the recitation of Claim 1 "wherein the liner is removable from the susceptor without requiring disassembly of the susceptor." As set forth in detail above, the Kordina susceptor must be disassembled to remove the liner plates 16, 17. By contrast, the liner 150 of Applicants' exemplary apparatus and the liner as recited in Claim 1 are "removable from the susceptor without requiring disassembly of the susceptor." This is a functionally significant distinction. The provision of a liner that is removable from the susceptor without requiring disassembly of the susceptor as claimed may allow for reductions in cost of use and downtime. The liner may be cost-effectively and efficiently removed for replacement or cleaning (*e.g.*, to scrape away parasitic deposits) without requiring replacement or disassembly of the susceptor. Moreover, the liner may be removed without requiring removal of the housing assembly from a reactor assembly or disassembly of the remainder of the housing assembly. Kordina does not provide or suggest these features or advantages.

The Action further contends:

However making elements of an apparatus separable has been held obvious *In re Dulberg* 129 USPQ 148 [sic] (CCPA 1961).

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 10 of 17

While it may be true that making elements of an apparatus separable has been held obvious in some cases, it clearly does not follow (and is not the law) that making elements of an apparatus separable is in all cases obvious. Applicants question whether the analysis of *In re Dulberg*, 129 U.S.P.Q. 348 (CCPA 1961), a 1961 opinion of the Court of Customs and Patent Appeals, is still appropriate in view of the guidelines for evaluating obviousness as recently, repeatedly and clearly stated by the Federal Circuit. Moreover, *In re Dulberg* does not assert that making elements of an apparatus separable without requiring disassembly of a selected component is obvious.

In any event, the present case is clearly distinguishable from *In re Dulberg*. In *In re Dulberg*, the cited reference taught a holder and a separately formed cap that was press fit onto the holder. The CCPA stated that, if desirable, it would have been obvious to have made the cap removable, and that this "could be done by anyone having the ordinary skills of this art simply by making the fit sufficiently loose to permit the ready manual removal of the cap." *Id.* at 349. In the present case, the Kordina apparatus could not be modified to make the plates 16, 17 removable (without disassembly of the wall pieces 11-14) with only a simple modification as proposed in *In re Dulberg*. In Kordina, the plates 16, 17 are sandwiched between the top and bottom wall pieces 13, 14 and the lateral wall pieces 11, 12 such that the susceptor wall pieces 11, 12, 13, 14 must be disassembled to remove the plates 16, 17. *See*, Kordina at col. 5, lines 45-65. It is not apparent how the Kordina apparatus might be modified to satisfy the recitation of Claim 1, nor does the Action suggest any suitable modification that would achieve the claim recitation "wherein the liner is removable from the susceptor without requiring disassembly of the susceptor."

Moreover, both the CCPA and the Federal Circuit have consistently held that when a Section 103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the primary reference, such a proposed modification is not proper and the *prima facie* case of obviousness cannot properly be made. *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984). It is likely that any modification to Kordina that would allow the plates 16, 17 to be removed from the wall pieces 11-14 without disassembly would destroy, at least in part, the functionality of the Kordina apparatus. The plates 16, 17 are deliberately inserted between the side wall pieces

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 11 of 17

11, 12 and the top wall piece 13 and between the side wall pieces 11, 12 and the bottom wall piece 14 to prevent etching of the SiC-coating and the walls of the susceptor close to the edges of the SiC plates (*see, e.g.*, Kordina at col. 3, lines 30-44 and col. 6, lines 9-16).

In summary, it appears that the Action has attempted to read the recitation "wherein the liner is removable from the susceptor without requiring disassembly of the susceptor" out of Claim 1 altogether. However, the meaning of the recitation is clear and does not describe the apparatus of Kordina. Accordingly, Claim 1 is patentable over the cited art. Claim 2 depends from Claim 1 and is therefore allowable for at least these reasons.

Claims 3 and 8-10:

Claim 3 stands rejected under Section 103 over Kordina in view of Kuramata and Mezey. Claim 3 recites:

3. A housing assembly for an induction heating device, the housing assembly defining a processing chamber and comprising:
 - a) a susceptor surrounding at least a portion of the processing chamber; and
 - b) a thermally conductive liner interposed between the susceptor and the processing chamber, wherein the liner is separately formed from the susceptor;
 - c) wherein the susceptor includes a platter region, the housing assembly further including:
 - a platter adapted to support the article disposed in the processing chamber and overlying the platter region;
 - and
 - an opening defined in the liner and overlying the platter region.

By way of example, in the embodiment described in Applicants' specification, the bottom liner 150 defines an opening 156. The opening 156 overlies and exposes a platter region 112 on the bottom susceptor member 110. A platter 140 is received in the opening 156 and directly overlies the platter region 112 of the bottom susceptor member 110 without a portion of the liner 150 being interposed therebetween. In this manner, the internal surfaces of the housing assembly 100 (*i.e.*, the surfaces in fluid communication with the passage 102) are maintained at a more spatially uniform temperature so that the thermal gradients in the

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 12 of 17

vicinity of the substrate are reduced. Restated, a more isothermal environment may be created in the passage 102 for the substrate 5 such that the temperature of the portion of the housing assembly 100 in contact with the substrate 5 (*i.e.*, the platter 140) is at substantially the same temperature as the other surfaces defining the passage 102 (*i.e.*, the interior surfaces of the liners 150, 160 and the side susceptor members 130). The substrate 5 may therefore itself be substantially the same temperature as the surfaces defining the passage 102. As a result, the problems mentioned in Applicants' specification associated with undesirably large thermal gradients may be reduced. For example, the formation of loose deposits may be eliminated or reduced. The process (*e.g.*, an epitaxy process) may be more accurately controlled.

In support of the rejection, the Action initially contends at page 7:

Regarding Claim 3: Kordina et al teaches a housing assembly (Figures 2, 5) for an induction heating device, the housing assembly defining a processing chamber and comprising:
a susceptor 6 surrounding at least a portion of the processing chamber (Fig. 2); and
a thermally conductive liner (plates 16, 17 – Figure 5) interposed between the susceptor and the processing chamber (Fig. 5 Item 16 and 17), wherein the liner is separately formed from the susceptor;
wherein the susceptor includes a platter region {area/region where plate 5 (platter) is located, Fig. 2}, the housing assembly further including:
plate (platter) 5 adapted to support the substrate (article) 2 disposed in the processing chamber and overlying the platter region.

However, the cited Figures 2 and 5 of Kordina illustrate two different embodiments. Figure 2 illustrates a prior art embodiment while Figure 5 shows an embodiment of Kordina.

The Action next states, "Kordina does not expressly teach an opening defined in the liner and overlaying the platter region." Applicants respectfully submit that Kordina does not in any way even imply such a feature. To the contrary, at col. 7, lines 37-46, Kordina states:

This means no severe etching due to so called hot spots, and the fact that the SiC-plates cover the entire bottom and ceiling of the susceptor channel 1 and that they are inserted between the bottom and top wall piece and the latter wall pieces means that the edges of the SiC-plates are hidden outside the susceptor channel, so that the problem of severe etching close thereto will be eliminated. Thus, the lifetime of the susceptor may be

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 13 of 17

prolonged with respect to susceptors already known.

(Emphasis added). Thus, Kordina teaches away from the provision of an opening in the liner 16.

The Action next states at pages 7-8:

Kuramata teaches (Figures 3, 5, 6) a substrate heating apparatus that includes a substrate holder (platter) 4 with a substrate 3 and a liner 12 with an opening (not shown in drawing) for gases to reach substrate 3 after flowing over the liner 12 (as shown in Figure 5) thus exposing the platter region (of platter) through opening in the liner [Formal translation of the reference has been requested].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the liner of Kordina et al so as to have an opening as taught by Kuramata to enable process gases flow to the substrate for processing.

The asserted provision of an opening in the component 12 of Kuramata to permit gases to reach the substrate 3 provides no motivation to modify Kordina as proposed. In Kordina, the gases already are directed to the substrate; therefore, there is no need for an opening in the liner 16 to permit gases to reach the substrate.

Additionally, referring to the English language translation of Kuramata provided by the Examiner, the component 4 of Kuramata is a susceptor, not a platter over a susceptor. Thus, Kuramata and Kordina both fail to teach or disclose a platter as claimed interposed between an article (e.g., a semiconductor wafer) and a susceptor.

The remaining stated bases for the rejection are not understood. Mezey discloses a recess 134 in a wall of a chamber 154, not an opening in a liner that overlies a susceptor. Mezey and Kordina are not "analogous" with respect to the aspect at issue. As best understood, the process chamber 54 of Mezey is not a susceptor. Rather, the process chamber 54 is intended to be heated by heating elements 66 such as electrical powered heating elements (*see, e.g.*, Mezey at col. 5, lines 27-45). Thus, Mezey would not face the concerns inherent in a susceptor-heated CVD apparatus. Rather, the proposed modification of Kordina in view of Mezey would likely cause the types of problems Kordina is directed to obviating. As discussed above, Kordina explicitly teaches that the liners are to extend fully across the

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 14 of 17

walls of the susceptor to prevent the presence of SiC plate edges in the susceptor channel and resulting hot spots. Forming an opening in the liner plate 16 would introduce such edges into the channel. Thus, one of ordinary skill in the art would not regard the Mezey platter arrangement as applicable to or suitable for the Kordina apparatus.

Accordingly, Claim 3 is patentable over the cited art. Claim 8 depends from Claim 3 and is therefore allowable for at least these reasons.

Claim 4 and 11:

Claim 4 stands rejected under Section 103 over Kordina in view of Kuramata and Mezey. Claim 4 recites:

4. (Original) A housing assembly for an induction heating device, the housing assembly defining a processing chamber and comprising:
- a) a susceptor surrounding at least a portion of the processing chamber; and
 - b) a thermally conductive liner interposed between the susceptor and the processing chamber, wherein the liner is separately formed from the susceptor;
 - c) wherein the liner varies in thickness along at least a portion of its length.

In support of the rejection under Section 103, the Action states, "Further, Kuramata discloses a housing assembly (Figure 5) for an induction heating device with a liner that varies in thickness along at least a portion of its length (Page 2, Lower Right Column, Lines 1-7)". It is not clear to Applicants what passage of Kuramata the Action intends to cite; however, Kuramata does not appear to in any way disclose the liner 12 as varying in thickness along its length. The only "thickness" referred to in Kuramata is the thickness of the film formed on the wafer (which may vary +/- 20%, for example). Thus, both Mezey and Kuramata fail to disclose a liner that "varies in thickness along at least a portion of its length" as claimed.

Additionally, as best understood, the process chamber 54 of Mezey is not a susceptor. Rather, the process chamber 54 is intended to be heated by heating elements 66 such as electrical powered heating elements (*see, e.g.*, Mezey at col. 5, lines 27-45). Thus, Mezey does not disclose a thermally conductive liner interposed between a susceptor and a

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 15 of 17

processing chamber as claimed. Kuramata does not disclose a liner as claimed that has variable thickness along its length and is interposed between a susceptor and a processing chamber.

In view of the foregoing, Applicants submit that Claim 4 is patentable over the cited art. Claim 11 depends from Claim 4 and is therefore allowable for at least the foregoing reasons.

Claims 5-7 and 12:

Claim 5 stands rejected under Section 103 over Kordina in view of Hozlein. Claim 5 recites:

5. A housing assembly for an induction heating device, the housing assembly defining a processing chamber and comprising:
- a) a susceptor surrounding at least a portion of the processing chamber; and
 - b) a thermally conductive liner interposed between the susceptor and the processing chamber, wherein the liner is separately formed from the susceptor;
 - c) wherein the susceptor includes a susceptor core of a first material and a susceptor coating of a second material; and
 - d) wherein the second material is selected from the group consisting of refractory metal carbides; and
 - e) wherein the liner is interposed between the susceptor coating and the processing chamber.

As noted by the Action, the susceptor members 11, 12, 13, 14 of Kordina are formed of graphite coated with SiC, and Kordina does not teach the use of a coating selected from the group consisting of refractory metal carbides. (Action at page 10). However, the Action contends:

Hölzlein et al teach a housing assembly (Figures 1, 2) for an induction heating device, the housing assembly defining a process chamber and comprises a susceptor 13 and a base plate (thermally conductive liner) 17 and where the susceptor has a coating 20 of TaC (refractory metal carbide) {Column 7, lines 15-65}.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to replace susceptor coating in Kordina et al' apparatus with a coating of refractory metal carbide as taught by Hölzlein

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 16 of 17

et al in the apparatus of Kordina et al so that gas stream flowing in the chamber does not take up carbon atoms from inner wall surface of susceptor (Column 7, lines 35-45).

Claim 5 is directed to a housing assembly for an induction heating device wherein the susceptor includes a core that is coated with a material selected from the group consisting of refractory metal carbides (e.g., TaC), and a liner is interposed between the susceptor coating and the processing chamber. In contrast, the baseplate 17 of Hölzlein is located between the outer container layer 21 and the coating 20, not between the coating 20 and the processing chamber. By design, the coating 20 of Hölzlein interfaces with the gas stream. See, e.g., Hölzlein at col. 7, lines 39-48 and lines 60-64. Thus, Hölzlein does not suggest the use of a coating of a refractory metal carbide on a susceptor core, wherein a liner is interposed between the coating and a processing chamber. Moreover, Hölzlein teaches nothing with respect to materials for use in coating a susceptor core separated from a processing chamber by a liner.

In Kordina, only the coatings on the susceptor pieces 13, 14 could correspond to the claimed susceptor coating, there being no liners between the susceptor pieces 11, 12 and the processing channel. However, the gas stream is prevented from taking up carbon atoms from the susceptor pieces 13, 14 by the liners 16, 17. That is, the liners 16, 17 separate the susceptor pieces 13, 14 from the gas stream so that the gas stream and the coatings on the susceptor pieces 13, 14 do not interface. Therefore, the proposed reason for modifying Kordina in view of Hölzlein to include a refractory metal susceptor coating is irrelevant to the susceptor pieces 13, 14 and is not motivation for modifying Kordina as suggested is apparent from the cited art.

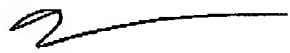
In view of the foregoing, Applicants respectfully submit that Claim 5 as amended is patentable over the cited art. Claims 6, 7 and 12 depend from Claim 5 and are therefore allowable for at least the foregoing reasons.

In re: Sumakeris et al.
Serial No.: 10/714,214
Filed: November 14, 2003
Page 17 of 17

CONCLUSION

Applicants submit that the present application is in condition for allowance and the same is earnestly solicited. Should the Examiner have any matters outstanding of resolution, he is encouraged to telephone the undersigned at 919-854-1400 for expeditious handling.


Respectfully submitted,


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